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(56) Documents Cited:

GB 2384453 A	GB 2245516 A
GB 2241450 A	GB 2234697 A
GB 1344117 A	EP 0649694 A1
US 4586408 A	US 3870432 A

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UK CL (Edition V) B3C C1B14B, B3T T4A15 T4A21J T4A8B T4A8G
INT CL[7] B23B 5/16 51/00, B23D 77/00 77/14 79/02
Other: Online: PAJ, WPI and EPODOC

(54) Abstract Title: Pipe Trimming tool

(57) The tool forms a bevel or chamfer on an outer rim of an end of a pipe, and cleans off burrs present on the end of the pipe. The tool includes a rotatable support (3) adapted to align a longitudinal axis of the pipe with the rotational axis of the support (3). A number of angled cutters (4,5,6) are so mounted to the support (3) that movement of the rotatable support towards an end of the aligned pipe causes engagement of the cutters (4,5,6) with the end of the pipe to form a bevelled edge when the support is rotated.

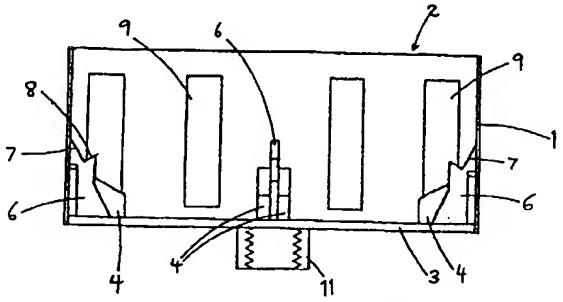

Fig 1

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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 1995

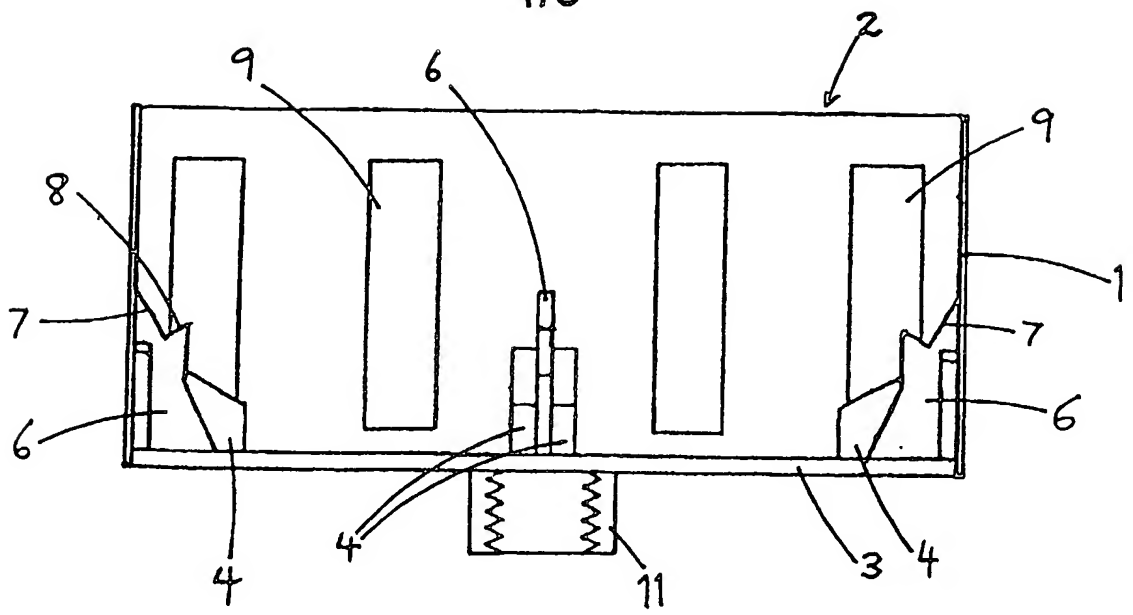

Fig 1

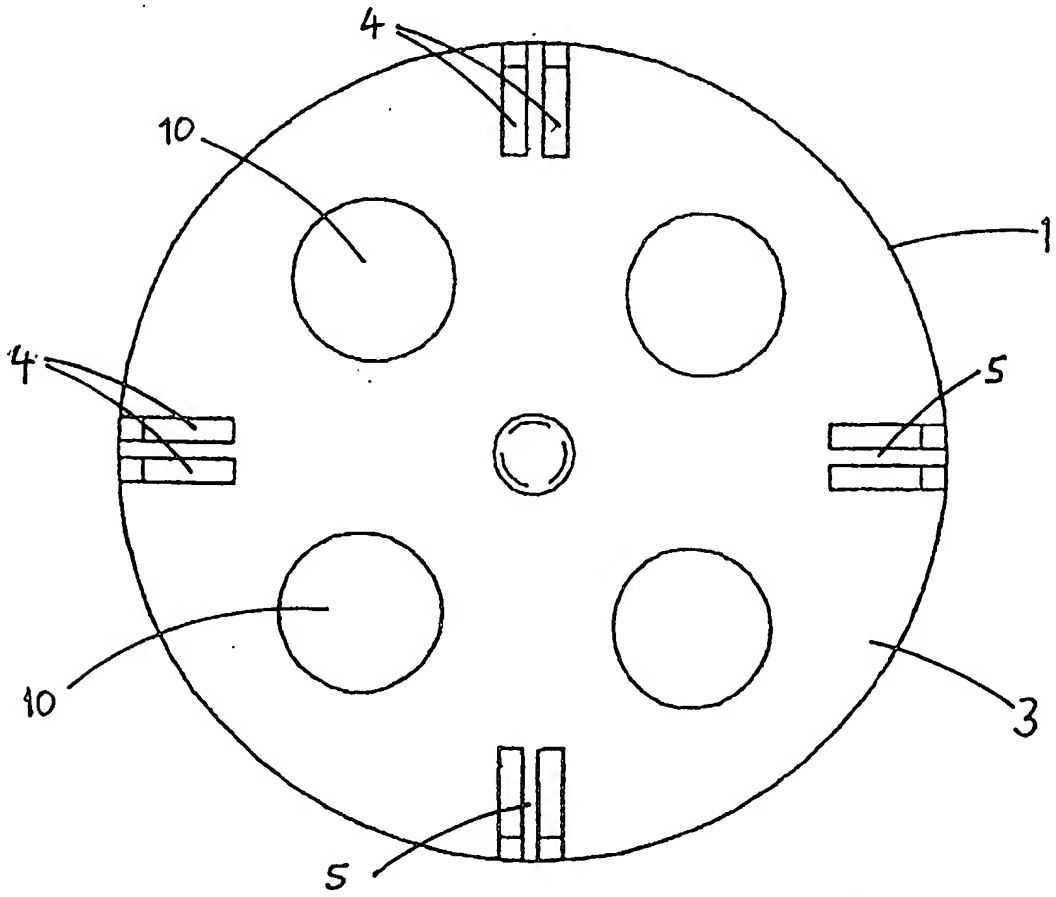

Fig 2

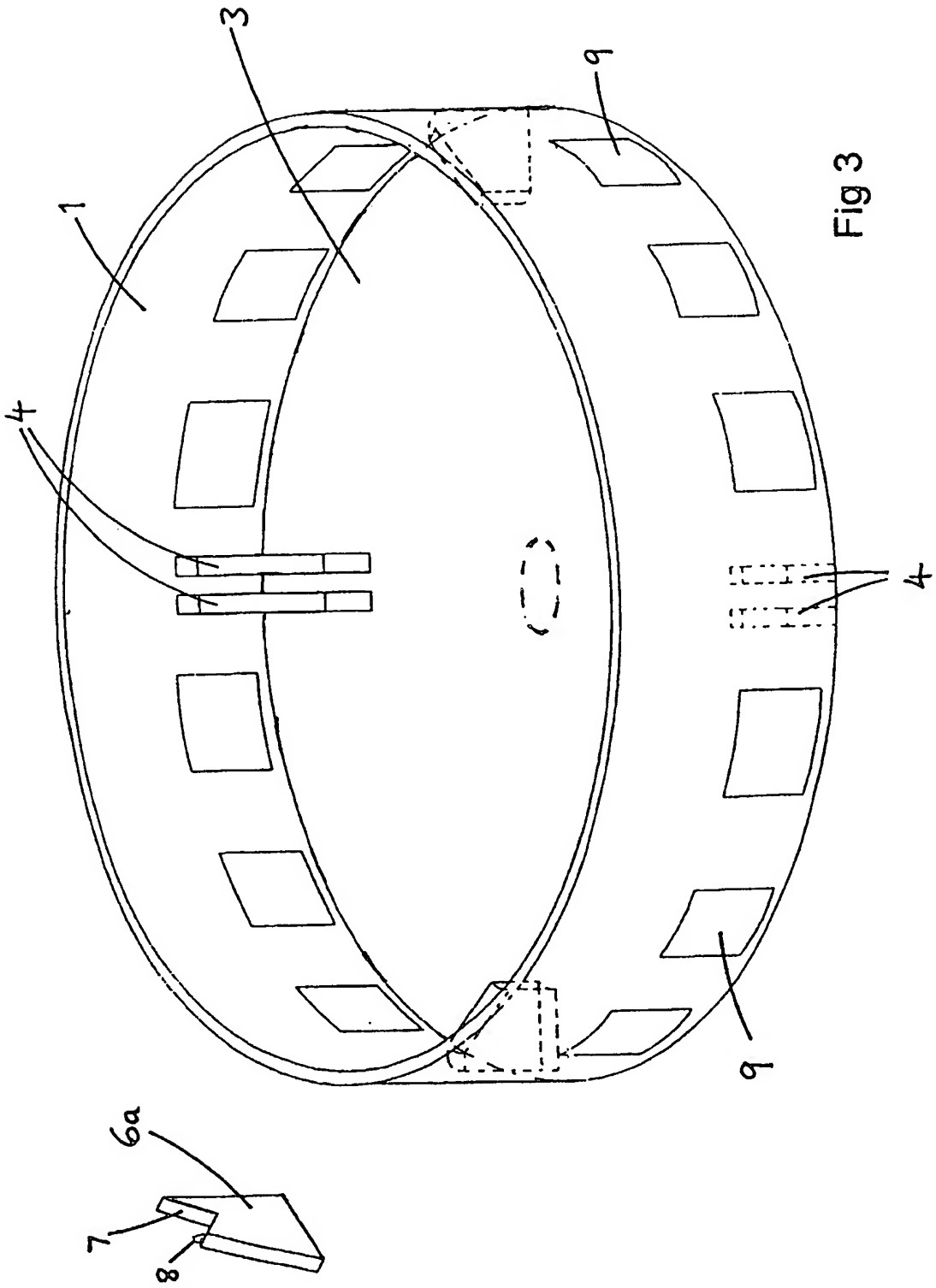

Fig 3

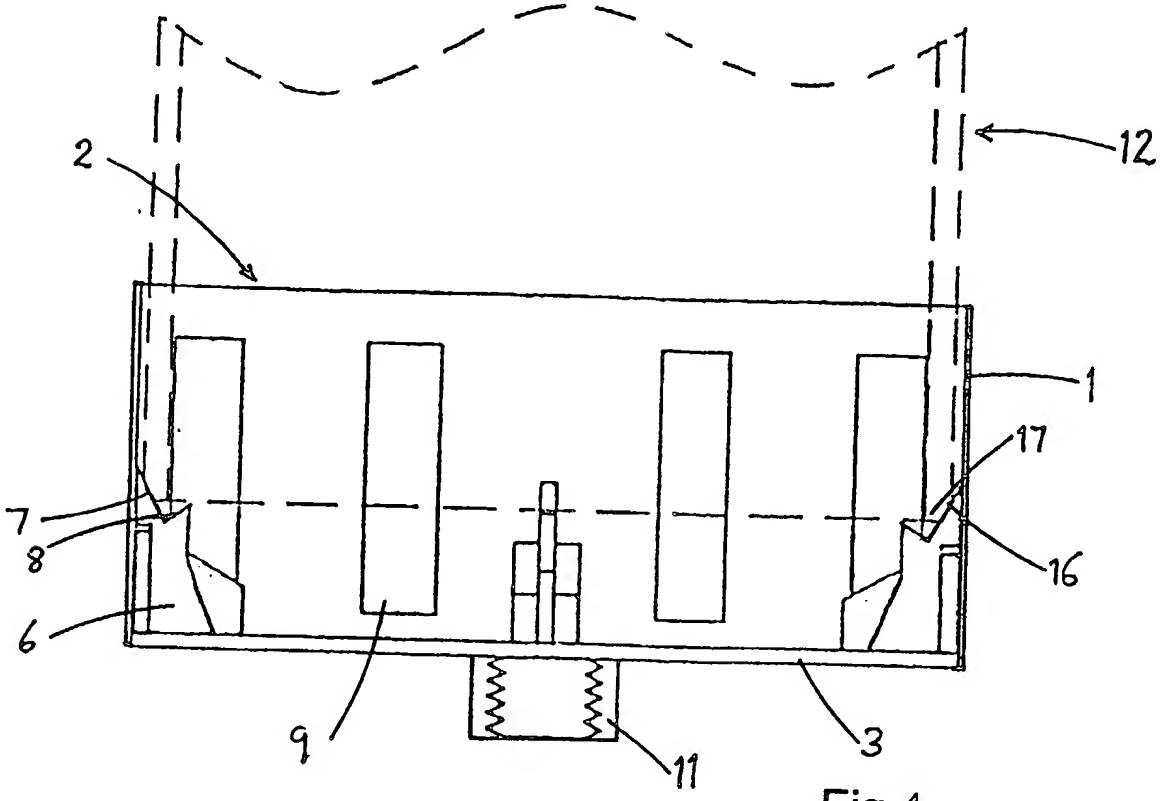

Fig 4

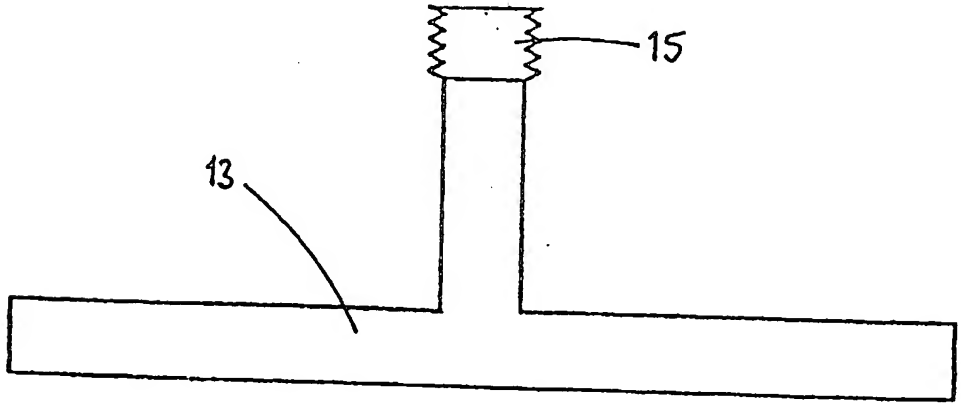

Fig 5

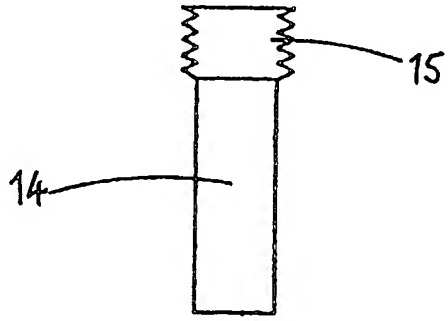

Fig 6

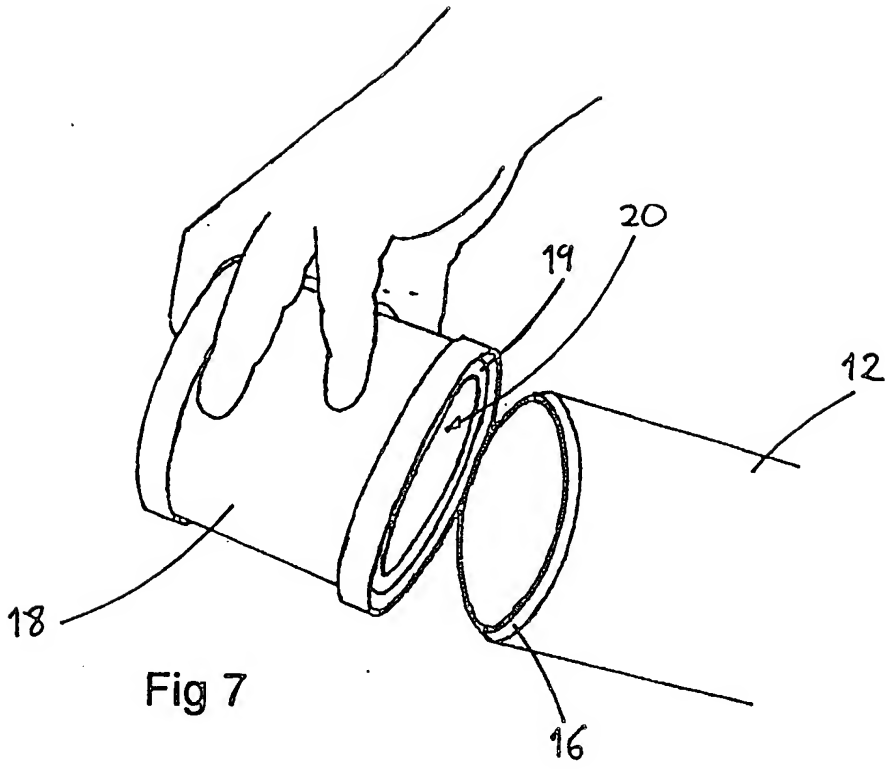

Fig 7

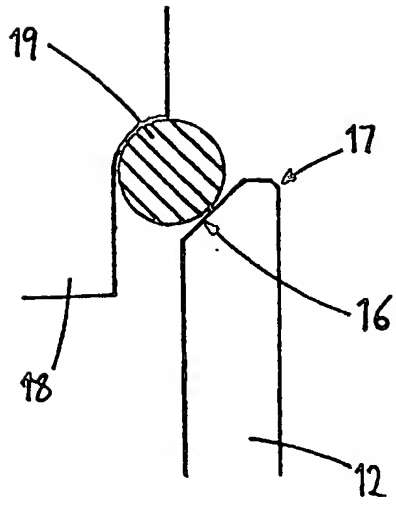

Fig 8A

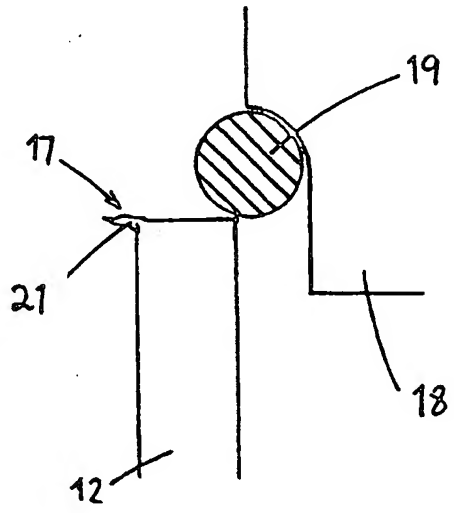

Fig 8B

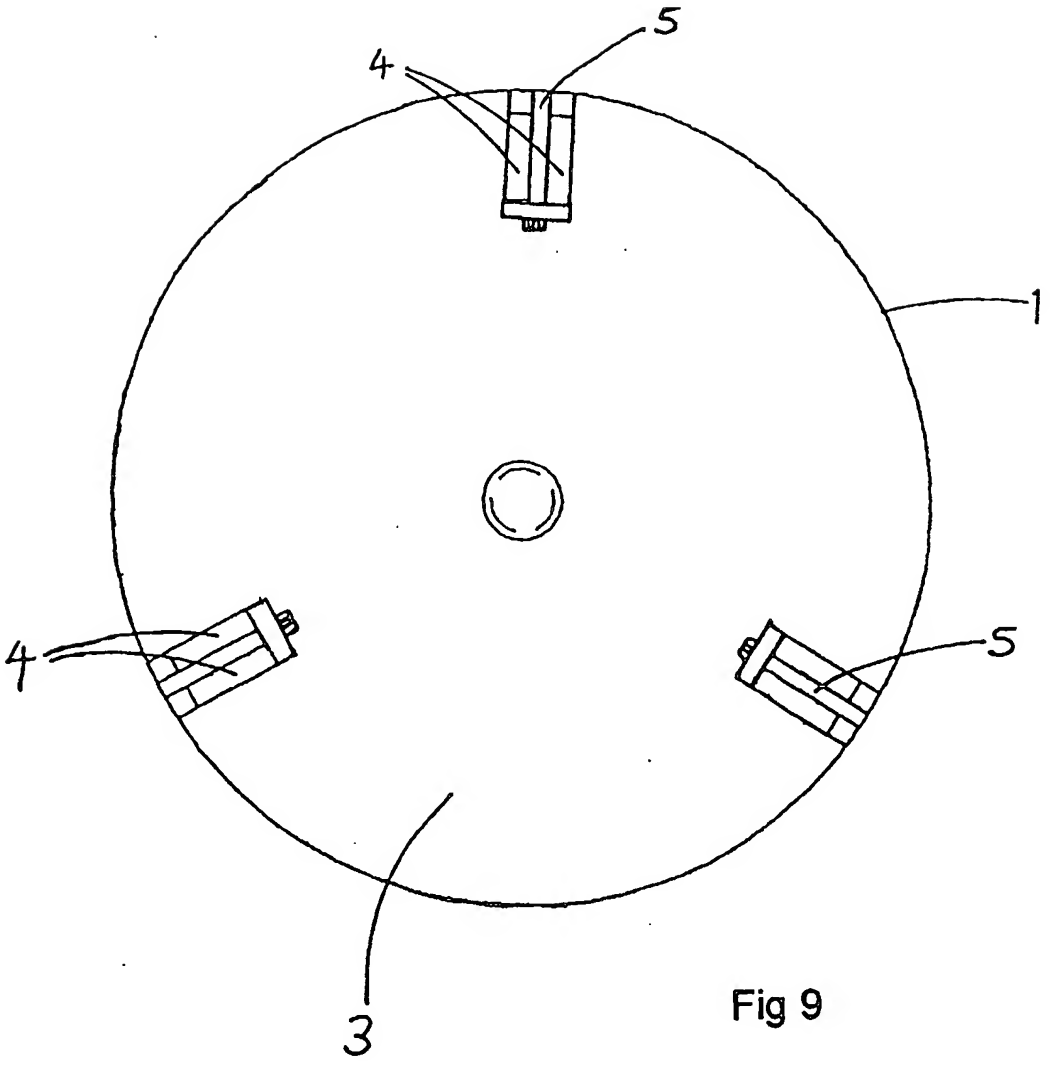

Fig 9

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PIPE TRIMMING TOOL

The present invention relates to a device for the preparation of an end of a pipe to aid its insertion into a socket. More particularly, but not exclusively, it relates to a tool for the rapid creation of a bevelled edge on an end of a plastics pipe to ease its insertion into a fitting provided with an elastomeric sealing ring. It further relates to a method of forming such a bevelled edge using such a tool.

Water supply piping and sewage/waste piping are conventionally constructed from lengths of plastics pipe, connected by inserting the ends of the lengths of pipe into socketed joints and fittings. The pipes generally comprise uPVC (unplasticised polyvinyl chloride), and are supplied in a range of standard dimensions, having a range of correspondingly sized fittings.

For example, uPVC pressure pipe for cold water is covered by British Standard BS3505, German Standards DIN8061/8062 and American Standard ASTM D1785. UPVC pipes for waste are covered by BS4514 (soil and ventilating pipe), BS4660 (below ground and sewerage systems), BS5481 (gravity sewerage system) and DIN19531 (discharge system

inside building). Each standard specifies pipe outside diameters and wall thicknesses (which for pressure pipes depend on their pressure rating). Many combinations of outside diameter and wall thickness are common to several of the above standards. For a residential building site, only a limited number of uPVC pipe sizes will normally be encountered, usually falling between 50 and 150 millimetre nominal size (the latter, for example, being specified to have an actual outside diameter of 160.0 to 160.4 millimetres).

The fittings are provided with a circumferential O-ring seal of rubber or other elastomer adjacent the mouth of each socket, to hold the pipes securely in the fitting, and to prevent leakage at the joint.

The pipes are usually sawn to length as required on site. It is difficult to force the resulting flat end of the pipe into the fitting, past the seal, given the tight clearances involved. The outer rim of the end of the pipe can even damage or displace the seal if excessive force is employed. The normal practice is hence to chamfer the outer rim of the end of the pipe to ease its passage. This is at present carried out manually, using a hand rasp or an abrasive pad. It is a time consuming process to chamfer all around the rim of a pipe, particularly for the larger sizes. The resulting chamfer is also frequently uneven, potentially reducing its effectiveness.

A further problem is that both sawing and chamfering can leave burrs, particularly around the inner rim of the end of a pipe. These burrs can potentially damage the hands of a worker handling the pipe, damage the O-ring seal, or cause snagging of some through flowing materials, leading possibly to blockage. Hence such burrs should be cleaned off. However, since this would involve a further time-consuming manual step, it is often omitted.

It is hence an object of the present invention to provide a device which may be used to form a bevel or chamfer on an outer rim of an end of a pipe, quickly, conveniently and accurately. It is also an object of the present invention to provide a device which may at the same time clean off burrs present on the end of the pipe. It is further an object to provide a method of forming a bevel or chamfer on the end of a pipe using such tool.

According to a first aspect of the present invention, there is provided a device for forming a bevel on an end of a pipe, comprising support means, means to rotate said support means, guide means mounted to the support means to align a longitudinal axis of the pipe with the rotational axis of the support means and angled cutting means so mounted to the support means that movement of the rotatable support means towards an end of the aligned pipe brings said cutting means into contact with the end of the pipe to form a bevelled edge thereon.

Preferably, the guide means comprises a hollow cylinder mounted coaxially to the rotational axis of the support means and dimensioned to receive a pipe of a preselected external diameter.

The support means may then comprise a circular plate forming an end of said hollow cylinder.

Advantageously, the cutting means comprises a plurality of angled cutting elements each mounted to the support means adjacent an inner wall of the hollow cylinder.

Each said cutting element may be provided with a first oblique cutting edge contactable with the outer rim of the end of a pipe inserted into an open end of the hollow cylinder.

Each said cutting element may further be provided with a second oblique cutting edge contactable with an inner rim of the end of said pipe.

Said second cutting edge may thus remove burrs and the like from said inner rim while the first cutting edge forms a bevelled edge on said outer rim.

Said first and second oblique cutting edges may meet, thereby forming a "V" shape.

Alternatively, a separate set of angled cutting elements may be provided, each having an oblique cutting edge contactable with said inner rim.

Said cutting elements may comprise blade means, scraper means, and/or abrasive means.

Preferably, said cutting elements may each comprise steel blade means.

The cutting elements are preferably detachably mounted to the support means.

The support means may be provided with pairs of support blocks, each said pair defining a slot therebetween to receive a cutting element.

Each cutting element may be gripped firmly between a respective pair of support blocks.

Optionally, the support blocks of each said pair may extend slightly convexly one towards the other, such that thc slot therebetween is locally slightly narrower than a corresponding dimension of thc cutting element.

The cutting elements may be urged into thc respective slots by contact with the end of the pipe.

The walls of the hollow cylinder are preferably apertured to allow waste material removed from thc end of the pipe to exit from the cylinder.

Advantageously, the support means may be apertured to allow said waste material to exit from the cylinder.

The means to rotatc the support means may comprise a spigot, mounted to a face of the support means remote from the cutting means and insertable into a chuck of a conventional power tool.

Alternatively, the means to rotate the support means may comprise a handle adapted to be turned manually, and mounted to said remote face of the support means.

The means to rotate the support means may be permanently mounted to the support means.

Alternatively, the means to rotate the support means may be detachably mounted to the support means, optionally via a threaded socket mounted to said remote face of the support means.

According to a second aspect of the present invention, there is provided a method of forming a bevelled edge on an end of a pipe, comprising the steps of providing a device as described in the first aspect above, inserting an end of a pipe to be bevelled into the guide means of the device, rotating the device and bringing the outer rim of the end of the pipe into contact with the cutting means of the device to form the bevelled edge.

Preferably, the method comprises the step of bringing the inner rim of the end of the pipe into contact with the cutting means of the device to remove burrs and the like therefrom, simultaneously with the formation of a bevelled edge on the outer rim of the end of the pipe.

Embodiments of the present invention will now be more particularly described, by way of example and with reference to the accompanying drawings, in which:

Figure 1 is a cross-sectional view of a device embodying the invention;

Figure 2 is a plan view of the device of Figure 1;

Figure 3 is a perspective view of an alternative form of the device, together with an alternative form of blade therefor;

Figure 4 is a cross-sectional view of the device of Figure 1 in use;

Figure 5 shows a handle, connectable to the device of Figure 1 for its manual operation;

Figure 6 shows an adapter to connect the device of Figure 1 to a power tool;

Figure 7 shows a pipe, bevelled with a device embodying the invention, being mated with a fitting incorporating an O-ring seal;

Figure 8A shows, in schematic cross-section a part of an end of a pipe bevelled as described herein, in contact with an O-ring seal;

Figure 8B shows, in schematic cross-section, an unbevelled end of a pipe in contact with an O-ring seal; and

Figure 9 is a plan view of a preferred embodiment of the device.

Referring now to the drawings, and to Figures 1 and 2 in particular, the device comprises a cylindrical aluminium or steel drum 1, open at a first end 2 and with a circular base plate 3 substantially closing an opposite end of the drum 1, forming a cup.

Four pairs of blade holders 4 are spaced equiangularly around a margin of the base plate 3, mounted to both the base plate 3 and the drum 1 in the angle where they meet. A slot 5 is formed between each pair of blade holders 4, into each of which a blade 6 is inserted (omitted from Figure 2 for clarity). The blade holders 4 of each pair are slightly bellied, one towards the other, such that the corresponding blade 6 is firmly held therebetween, but may be manually inserted and removed, using for example pliers. Use of the device, as described below, urges the blades 6 more firmly into place, so no more secure mounting is required. It is envisaged that the blades 6 will constitute a consumable item, to be replaced as they wear out.

It is, of course, possible to employ more, or less, than the four blades described above. For example, large diameter pipes may require eight blades.

The blades 6 shown have two operative edges, a main bevelling edge 7 and a secondary de-burring edge 8. The main bevelling edge 7 is angled to contact an outer rim of an end of a

pipe inserted into the open end 2 of the device, and the de-burring edge 8 is angled to contact an inner rim of the end of the pipe. In other embodiments (not shown) simpler blades are used, having only a bevelling edge 7, and dispensing with the deburring edge 8.

The walls of the drum 1 are pierced by elongate slots 9, which allow swarf from the trimming process to escape from the drum 1, and also reduce the weight of the device. Similarly, the base plate 3 may be provided with a plurality of openings 10, to allow swarf to escape and to reduce the device's weight further.

An internally threaded socket 11 is mounted centrally to a face of the base plate 3 remote from the drum 1, permitting attachment of the device to various means of rotation.

Figure 3 shows a device of slightly different proportions to that shown in Figures 1 and 2. The drum 1 is pierced by slots 9, but the base plate 3 is not apertured. A variant form of blade 6a, shown separated from the device for clarity, has a slightly different overall profile to the blade 6 shown in Figure 1, but is similarly provided with a bevelling edge 7 and a de-burring edge 8.

Figure 9 shows, in plan view, an alternative preferred embodiment in which the base plate 3 is provided with only three pairs of blade holders 4, spaced one from another by 120°. Apart from their number and spacing, the holders 4 function similarly to those of the embodiments shown in Figures 1 and 2. In operation, the balance of force is slightly improved and the device can be manufactured more economically.

In general herein, the term "blade" encompasses scrapers, cutting bits or even shaped sections of abrasive material, as well as elements with a knife-blade profile.

Figure 4 shows the device of Figure 1 in use. An uPVC pipe 12 (represented by dashed lines) has been sawn to a desired length, leaving a flat end, substantially perpendicular to the elongate axis of the pipe 12. This end of the pipe 12 has been inserted into the "cup" of the device through its open end 2. The drum 1 of the device is dimensioned to receive pipes of a predetermined standard outside diameter, leaving a relatively small clearance between the pipe 12 and an inside surface of the drum 1. The pipe 12 is thus aligned such that its elongate axis coincides substantially with the rotational axis of the device.

The device is mounted via its socket 11 either to a T-shaped handle 13 for manual rotation, or to a spigot 14 adapted to be held in a chuck of a power drill. Each of the handle 13 and the spigot 14 is provided with a threaded portion 15 connectable to the threaded socket 11 of the device. In other embodiments (not shown) a spigot on a handle is directly and permanently mounted to the base plate 3 in place of the socket 11 shown.

The device is rotated, by whichever means, and the blades 6 are brought into contact with the end of the pipe 12. As is shown, the main bevelling edge 7 of each blade 6 removes an outer rim of the end of the pipe 12, leaving a chamfered edge 16. Material removed from the pipe 12 by the blades 6 may leave the drum 1 via the slots 9 or the openings 10 (not shown in this view) of the base plate 3.

Figure 4 shows an intermediate stage of the process, in which the chamfered edge 16 has been formed on the pipe 12 by the bevelling edges 7 of the blades 6, but the de-burring edges

8 are not yet in contact with the pipe 12. Continued operation of the device will broaden the chamfered edge 16 and move the pipe 12 further into the device until the deburring edge 8 of each blade contacts an inner rim 17 of the end of the pipe 12 and cleans off any burrs there present.

Only a small number of different blade sizes are required, as in practice pipe wall thicknesses fall within a much narrower range than do pipe outside diameters.

Figure 7 shows a pipe 12 with a chamfered edge 16, formed by a device as described above, being mated with a connecting fitting 18. The fitting 18 has a rubber O-ring seal 19 located close to its mouth 20. As shown in Figure 8A, the chamfered edge 16 contacts the O-ring seal 19, gradually compressing it as the pipe 12 enters the fitting 18. The fitting 18 can thus be mated with the end of the pipe 12 with no more than firm manual pressure, rapidly and without risk of damage to the seal 19.

Figure 8B shows the equivalent situation with a non-chamfered pipe 12. The end of the pipe 12 meets the seal 19 at such an angle that it may dig into and damage the seal 19, and may even locally displace the seal 19 from its correct, sealing location. These Figures also demonstrate how a burr 21 on the inner rim 17 of the end of the pipe 12 may be cleaned off by no more than a brief contact with the deburring edge 8 of the blade 6.

When a device as described above is mounted to a standard electric power tool, an end of a pipe can be chamfered and deburred in a few seconds, compared to several minutes to carry out a less effective procedure using a rasp, file or abrasive pad. The savings in time and effort in the course of assembling a complete water supply or sewerage system for a house

would be considerable, and the incidence of damaged or displaced seals, and consequent leaks, would be greatly reduced.

CLAIMS

1. A device for forming a bevel on an end of a pipe, comprising support means, means to rotate said support means, guide means mounted to the support means to align a longitudinal axis of the pipe with the rotational axis of the support means and angled cutting means so mounted to the support means that movement of the rotatable support means towards an end of the aligned pipe causes engagement of said cutting means with the end of the pipe to form a bevelled edge thereon.

2. A device, as claimed in claim 1, wherein the support means comprises a circular plate and the guide means comprises a hollow cylinder mounted to the support means coaxially of its rotational axis of and dimensioned to receive a pipe of a predetermined external diameter.

3. A device as claimed in either claim 1 or claim 2, wherein the cutting means comprises a plurality of angled cutting elements each mounted to the support means adjacent an inner wall of the guide means.

4. A device as claimed in claim 3, wherein each said cutting element has a first oblique cutting edge contactable with the outer rim of the end of a pipe inserted into an open end of the guide means.

5. A device as claimed in claim 4, wherein each said cutting element is further provided with a second oblique cutting edge, contactable with an inner rim of the end of said pipe, to remove burrs and the like from said inner rim while the first cutting edge forms a bevelled edge on said outer rim.

6. A device as claimed in any one of claims 3 to 5, wherein any one or each of said cutting elements comprises blade means, scraper means, and/or abrasive means.

7. A device as claimed in any one of the preceding claims, wherein the support means further comprises a pair of support blocks, each pair defining a slot therebetween to receive a cutting element which is gripped firmly between a respective pair of support blocks.

8. A device as claimed in claim 7, wherein the support blocks of each said pair extend convexly one towards the other, such that the slot therebetween is locally narrower than a corresponding dimension of the cutting element.

9. A device as claimed in any one of claims 2 to 8, wherein a wall of the guide means and/or the support means is apertured to allow waste material removed from the end of the pipe to exit from the cylinder.

10. A device as claimed in any one of the preceding claims, wherein the means to rotate the support means comprises a spigot, mounted or mountable to a face of the support means remote from the cutting means and insertable either into a chuck of a conventional power tool or manually rotatable.

11. A device substantially as described herein with reference to the Figures of the accompanying drawings.

12. A method of forming a bevelled edge on an end of a pipe, comprising the steps of providing a device as claimed in any one of the preceding claims, inserting an end of a pipe to be bevelled into the guide means of the device, rotating the device and bringing the outer rim of the end of the pipe into contact with the cutting means of the device to form the bevelled edge.

13. A method as claimed in claim 12, further comprising the step of bringing the inner rim of the end of the pipe into contact with the cutting means of the device to remove burrs and the like therefrom, substantially simultaneously with the step of forming a bevelled edge on the outer rim of the end of the pipe.

Application No: GB 0314916.8
Claims searched: 1-13

Examiner: Marian Challis
Date of search: 24 September 2003

Patents Act 1977 : Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance	
X	1-7,9-13	GB 2234697 A	(EXCALIBUR) Figures 1-4
X	1-6,9-13	US 3870432	(STRYBEL) Figures 1-6
X	1-4,6,9-13	GB 2384453 A	(FULLER) Figures 1 and 2
X	1-4,6,7,10-13	US 4586408	(GOLDNER) Figures 1-6
X	1-6,11-13	EP 0649694 A1	(I.C.O.M.A.R.) Figures 1-8
X	1,3,4,6,9-12	GB 2245516 A	(ROSE) Figures 1 and 2
X	1-4,6.9-12	GB 2241450 A	(GRUNDY) Figures 1 and 2
X	1,3,6,9,11,12	GB 1344117	(STICKLER) Figures 1-7

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

Field of Search:

Search of GB, EP, WO & US patent documents classified in the following areas of the UKC[V]:

B3C, B3T

Worldwide search of patent documents classified in the following areas of the IPC[7]:

B23B, B23D

The following online and other databases have been used in the preparation of this search report:

PAJ, WPI and EPODOC